

Final
Description of Current Conditions Report
Atlantic Fleet Weapons Training Facility
Vieques Island, Puerto Rico



Prepared for
Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the
LANTDIV CLEAN II Program
Contract No. N62470-95-D-6007
CTO-031

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Tampa, Florida

February 2001

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Contract Task Order 031

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Contents

<u>Section</u>	<u>Page</u>
1 Project Background.....	1-1
1.1 RFI Background.....	1-1
1.2 Facility Background.....	1-1
1.3 Site and Environmental Setting Characteristics.....	1-3
1.4 AFWTF Investigation Summary	1-7
2 Descriptions of SWMUs, AOCs, and Pls.....	2-1
2.1 SWMU 01 - Camp Garcia Landfill.....	2-1
2.2 SWMU 02 - Fuels Off-Loading Site (Camp Garcia).....	2-2
2.3 SWMU 04 - Waste Areas of Building 303 (Camp Garcia)	2-2
2.4 SWMU 05 - Spent Battery Accumulation Area (Observation Post 1, Inner Range, AFWTF).....	2-3
2.5 SWMU 06 - Waste Oil and Paint Accumulation Area (Seabees Area at Camp Garcia)	2-3
2.6 SWMU 07 - Waste Oil Accumulation Area (Outside Building 303 at Camp Garcia)	2-4
2.7 SWMU 08 - Waste Oil Accumulation Area (Observation Post 1, Inner Range, AFWTF).....	2-4
2.8 SWMU 10 - Sewage Treatment Lagoons.....	2-5
2.9 SWMU 12 - Solid Waste Collection Unit Area (Observation Post 1, Inner Range, AFWTF).....	2-5
2.10 AOC A - Diesel Fuel Fill Pipe Area (Observation Post 1, Inner Range, AFWTF).....	2-6
2.11 AOC F - Rock Quarry (Camp Garcia)	2-6
2.12 AOC G - Pump Station and Chlorination Building at Sewage Lagoons (Camp Garcia).....	2-6
2.13 Photo-Identified Areas.....	2-7
3 Nature and Extent of Contamination.....	3-1
3.1 Previous Investigation Results.....	3-1
3.2 Exposure Pathways	3-1
4 Interim Corrective Action Measures.....	4-1
5 References.....	5-1

Appendix A: Well Construction Details

Appendix B: Photographs of SWMU and AOC Sites

List of Tables

<u>Number</u>	<u>Page</u>
1-1 Aerial Photograph Analysis – SWMUs, AOCs, and PIs.....	1-13
1-2 Demolition Records Search Results.....	1-16
2-1 Aerial Photograph Chronological Analysis of PIs.....	2-7

List of Figures

<u>Number</u>	<u>Page</u>
1-1 Site Location Map.....	1-2
1-2 Topographic/Land Use Map.....	1-4
1-3 Water Supply Well and Monitoring Well Location Map.....	1-10
1-4 Aerial Photographic Analysis.....	1-12

List of Acronyms

AFWTF	Atlantic Fleet Weapons Training Facility
AOC	Area of Concern
ATG	Air-to-Ground
BTEX	Benzene, toluene, ethylbenzene, and xylene
COPC	Chemical of potential concern
CTO	Contract Task Order
EMA	Eastern Maneuver Area
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
GIS	Geographic information system
GPS	Global positioning system
IAS	Initial Assessment Study
ID	Identification
IDWMP	Investigation-Derived Waste Management Plan
JIG	Joint Interest Group
LIA	Live impact area
msl	Mean sea level
Navy	U.S. Navy
NASD	Naval Ammunitions Support Detachment
NGFS	Naval Gunfire Support
NPDES	National Pollutant Discharge Elimination System
NSRR	Naval Station Roosevelt Roads
OB/OD	Open burn/open detonation
OP	Observation Post
PAOC	Potential Area of Concern
PETN	Pentaerythritol tetranitrate
PI	Photo-identified

PRASA	Puerto Rico Aqueduct and Sewer Authority
PREQB	Puerto Rico Environmental Quality Board
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RL	Reporting limit
SAR	Small arms range
SWMU	Solid Waste Management Unit
TPH	Total petroleum hydrocarbons
USGS	U.S. Geological Survey
UST	Underground storage tank

SECTION 1

Project Background

This Description of Current Conditions Report has been prepared for the Phase I Resource Conservation and Recovery Act of 1976 (RCRA) Facility Investigation (RFI) of the Eastern Maneuver Area (EMA) and Atlantic Fleet Weapons Training Facility (AFWTF) on Vieques Island, Puerto Rico. For the purpose of this report, the Naval Facility includes both of these properties. The objective of this report is to provide site information on the Naval Facility and to describe existing conditions at the nine Solid Waste Management Units (SWMUs), three Areas of Concern (AOCs), 12 Potential Areas of Concern (PAOCs) and 23 photo-identified (PI) areas that will be investigated as part of the Phase I RFI. This document supports the Master Work Plan (CH2M HILL, 2001a) and the Site-Specific Work Plan (CH2M HILL, 2001b) that have been prepared for the Phase I RFI for the AFWTF on Vieques Island, Puerto Rico.

The remainder of this section provides background information for the RFI and the Navy Facility, a description of the characteristics of the site and environment, a summary of previous investigations, and a description of existing environmental permits held by the Navy Facility.

1.1 RFI Background

On January 20, 2000, the United States Environmental Protection Agency (EPA) and the United States Department of the Navy (Navy) entered into an Administrative Order of Consent (EPA, 2000b) to perform an RFI at the Naval Facility on Vieques Island, Puerto Rico. The purpose of the RFI is to determine the nature and extent of potential releases of hazardous wastes, solid wastes, and/or hazardous constituents at or from the facility. The Consent Order was issued based on information gathered during a RCRA Facility Assessment (RFA) completed by A.T. Kearney, Inc., on October 13, 1988 (A.T. Kearney, 1988), and an updated RFA completed by the Puerto Rico Environmental Quality Board (PREQB) on September 27, 1995 (PREQB, 1995).

EPA's jurisdiction to issue the Consent Order derives from authority vested in EPA by Section 3008(h) of the RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984, which mandate compliance by generators of solid and/or hazardous waste.

1.2 Facility Background

Vieques Island has a land area of approximately 33,000 acres, and is located in the Caribbean Sea approximately 7 miles southeast of the eastern coast of the island of Puerto Rico (Figure 1-1). The Naval Facility is located on the eastern one-third of the island. For the purpose of the EPA Consent Order and this report, the Facility includes both the AFWTF (comprised of 3,600 acres), and the adjacent and wholly contiguous EMA (comprised of 11,000 acres). Both are under the command of U.S. Naval Station Roosevelt Roads (NSRR).

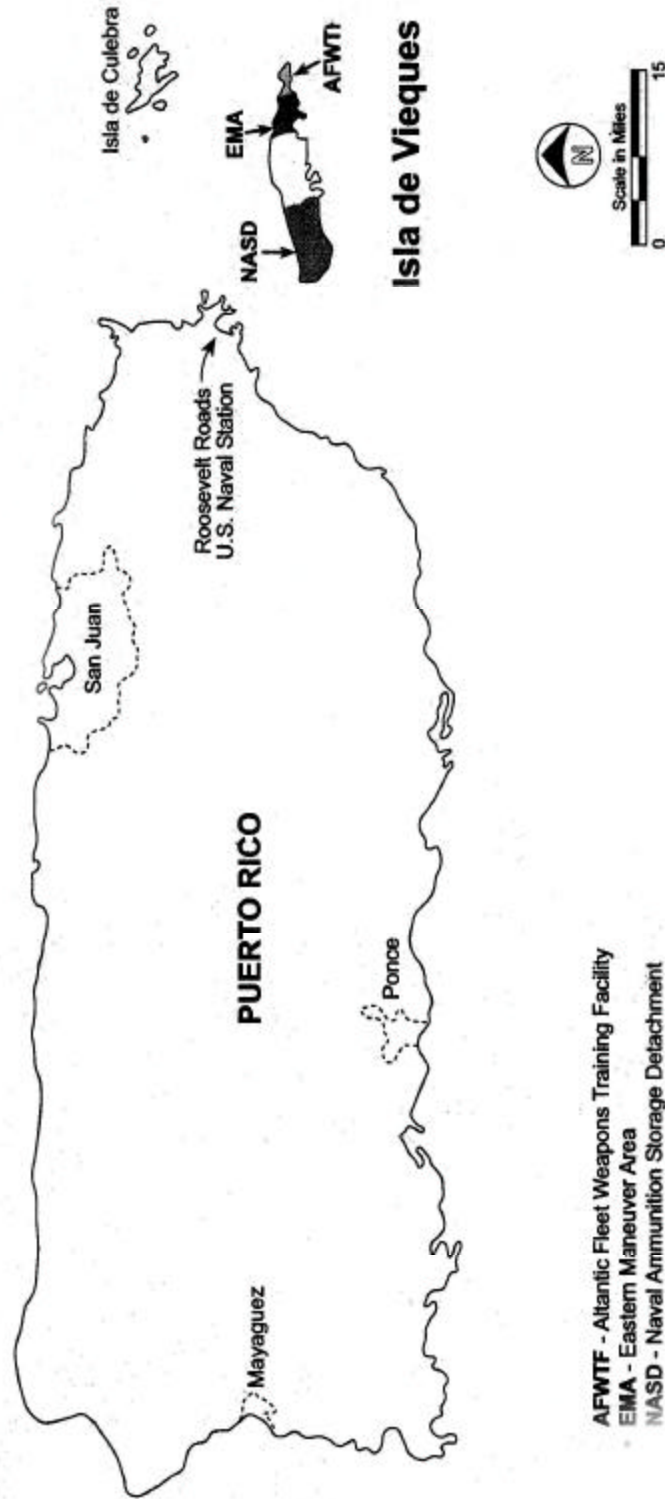


Figure 1-1
SITE LOCATION MAP
Vieques Island, Puerto Rico
CH2MHILL

A third Navy activity, the Naval Ammunition Support Detachment (NASD) located on the western end of Vieques Island, is not part of the Facility because it is not contiguous with the AFWTF or EMA, and therefore is not subject to the terms and conditions of the EPA Consent Order. In addition, NASD Vieques is regulated under the requirements of the Comprehensive Environmental Response and Conservation Act (CERCLA), not RCRA. In total, the Navy owns approximately 68 percent (22,600 acres) of the land area of Vieques Island, including the AFWTF, EMA, and NASD Vieques.

1.3 Site and Environmental Setting Characteristics

This section describes the characteristics of the site and environment, including land topography and use, climate, geology, soils, hydrology, and hydrogeology.

1.3.1 Topography

The topography of Vieques consists generally of hills and valleys throughout the entire island. The western side of the island consists of gently rolling hills with a deeper soil profile than the eastern side, which is more exposed rugged terrain. The highest point on the western side is approximately 1,000 feet above mean sea level (msl) at Monte Pirata. The highest point on the eastern side, where the AFWTF and EMA are located, is approximately 420 feet above msl at Cerro Matias. The coastal areas contain level terrain primarily made up of lagoons and mangrove swamps. The unexploded ordnance open burning (OB) and open detonation (OD) locations on the AFWTF are relatively level areas containing irregular drainage patterns as a result of continuous bombing exercises (PREQB, 1995). Figure 1-2 shows the site topography of the AFWTF and surrounding area.

1.3.2 Land Use

Land use in the vicinity of the AFWTF is shown on Figure 1-2. Generally, the AFWTF (3,600 acres) and EMA (11,000 acres) land areas remain undeveloped. The Navy land use comprises only a fraction of these two respective land areas.

The AFWTF provides facilities and schedules naval gunfire support (NGFS) and air-to-ground (ATG) ordnance delivery training for Atlantic Fleet ships, NATO ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic, conducts training for Marine amphibious units, battalion landing teams and combat engineering units in the EMA. Occasionally, naval units of allied nations with a presence in the Caribbean and the Puerto Rican National Guard also utilize the EMA.

The training areas have been in continuous use since World War II when the Navy acquired title to the land. Within the Inner Range of the AFWTF, the Atlantic Fleet's ships, aircraft, and marine forces carry out training in all aspects of NGFS, ATG ordnance delivery, air-to-surface mine delivery, amphibious landings, small arms, artillery and tank fire, and combat engineering. As part of normal operations, unexploded ordnance is periodically cleared from the AFWTF's Inner Range and destroyed by OB and OD at the Facility. In addition, unserviceable military munitions are periodically received from NASD and/or NSRR for OB/OD at AFWTF.

The non-Navy owned land immediately adjacent to the EMA boundary, also shown on Figure 1-2, is occupied by the civilian population and is used mostly for cattle pasture, minor agriculture, and urban development (USGS, 1989).

1.3.3 Climate

The climate of Vieques is characterized as warm and humid (tropical-marine), with frequent showers occurring throughout the year. A major factor affecting the temperature on Vieques is the easterly trade winds blowing across the island year-round. This wind moderates the temperature, which averages 79°F to 80°F throughout the year. The average rainfall is approximately 36 inches, with extremes of 25 inches in the east and 45 to 50 inches in the west (PREQB, 1995).

1.3.4 Geology

The underlying geology of Vieques is classified by rock and sediment deposits. The upland areas contain three rock types consisting of Upper Cretaceous volcanic rocks, Upper Cretaceous or Lower Tertiary intrusive rocks, and Upper Tertiary and Quaternary sedimentary rocks. The lowland areas are unconsolidated sediments of Quaternary age, consisting of alluvial deposits, beach and dune deposits, and swamp and marsh deposits.

The Upper Cretaceous rocks in the upland areas appear to be the oldest exposed rocks on Vieques. These rocks are believed to have been deposited in a marine environment, as was the case with rocks of the same age on the island of Puerto Rico.

Limestone of the upper Tertiary age is found in peninsulas extending into the sea from the southern and eastern coasts. Limestone of the Tertiary-Miocene age is also found along these coasts, and commonly referred to as Puerto Ferro limestone. Quaternary age deposits are typically found in the valleys and coastal areas. These deposits include beach, swamp, and alluvial deposits. The deposits of sand, swamp, and salt mud occur in the coastal areas.

Although sand and crushed quarried stone are typically geologic resources, the limestone on Vieques is too soft and not of the right purity for use as crushed stone or in cement. Quartz diorite, however, has served as a source of crushed rock for military construction. The sand on the island can be broken up into two major types: alluvial and marine-deposited calcareous sand. The alluvial sand is used in construction materials such as mortar types used in construction (PREQB, 1995).

1.3.5 Soils

Soils on Vieques Island are primarily residual, due to both climatic and subsurface rock conditions. The eastern side of the island has poorly developed soil because of the impermeable volcanic rock and the nature of the climate.

Soils on Vieques are typically classified into one of five groups. The first group is referred to as the Descalabrado series. This group accounts for 30 percent of the total land surface area on the island. This soil is shallow and well-drained, and typically very dark brown to dark grayish-brown. Grasses and shrubs are the only types of vegetation able to grow in this particular type of soil. Grazing, wildlife habitat, and woodland are the only other uses for this soil.

The second group is Vieques series, which accounts for approximately 26 percent of the total land surface area on the island. This series is typically shallow, and found in the upland regions of the island. The soil is dark brown in color, and has good drainage with moderate permeability.

The third group is the Coamo series. This soil makes up approximately 16 percent of the total land surface area on the island. This soil is typically deep and well-drained in nature. The surface layer is very dark and slightly acidic to neutral. Agriculture can be maintained here along with xeric trees and brush.

The fourth group is the Rock Land area. This area accounts for approximately 8 percent of the total land area on the island. This area is labeled Rock Land because either rock outcrops occur, or loose stones and boulders are common. Volcanic rock and limestone are the principal constituents of this area, with brush and shrubs as the only vegetation visible.

The fifth group, which accounts for the remaining 20 percent of the total land area of the island, is divided into nine additional categories: Ametia, Cartagena, Catano, Coastal Beaches, Descalabrado, Fraternidad, Jacana, Pandura, Paso Seco, Pancena and Pozo Blanco.

Although ATG ordnance delivery and NGFS exercises are conducted on Vieques, soil conditions have not been severely altered on the island, because of the vegetation, soil and surface drainage characteristics.

1.3.6 Hydrology

The streambeds found on Vieques Island flow either to the north or to the south until they reach the sea. Vieques does not have any perennial surface drainage, and has an average of 36 inches of annual rainfall. Of the 36 inches of annual rainfall, approximately 90 percent is lost to evaporation, based on statistics from the U.S. Virgin Islands. Of the remaining 10 percent, approximately 5 percent infiltrates into the ground recharging the groundwater aquifer, and 5 percent ends up as surface runoff.

1.3.7 Hydrogeology

The groundwater on the island occurs in two aquifers: the Valle de Resolucion, located beneath the western portion of the island, and the Valle de Esperanza, located beneath the southern portion of the island near Camp Garcia. As discussed above, approximately 5 percent of the annual precipitation infiltrates through the ground and supplies the aquifers. The Valle de Esperanza is the more productive of the two aquifers and, therefore, has been used as a source of drinking water in the past. The Valle de Esperanza aquifer formerly supplied water to Camp Garcia and Observation Post (OP) 1 of the Inner Range of the AFWTF. The Puerto Rico Aqueduct and Sewer Authority (PRASA) managed a series of 16 wells, which pumped approximately 450,000 gallons of water per day, though these wells. These wells are no longer active as a result of the installation of a water line from the island of Puerto Rico to Vieques Island in 1978. Camp Garcia was connected to the water line in the summer of 2000.

The U.S. Geological Survey (USGS) has performed a groundwater study on Vieques, including tests on the wells near Esperanza (see Section 1.4.2). The results indicate that the

groundwater contains high concentrations of sodium bicarbonate. Because of its high sodium content, the groundwater on Vieques is not suitable for irrigation over extended periods. The high levels of sodium results from sea spray infiltrating into the ground, and saltwater entering the groundwater supply through excessive groundwater withdrawal (PREQB, 1995) prior to 1978.

1.4 AFWTF Investigation Summary

Previous investigations associated with the AFWTF and EMA include the following:

- Initial Assessment Study (Greenleaf/Telesca, 1984)
- RFA (A.T. Kearney, 1988)
- Reconnaissance of the Groundwater Resources of Vieques Island (USGS, 1989), and Identification of Water Wells on Vieques (USGS, 1995)
- Updated RFA (PREQB, 1995)
- Hydrogeologic Investigation (Baker, 1999)
- Aerial Photographic Analysis, AFWTF, SWMUs 01 and 10 and AOCs F and G (Lockheed Martin, 1999)
- EPA Region II Groundwater Sampling Reports (EPA, 1999 and EPA, 2000)
- Air Photo Analysis of EMA/AFWTF (ERI, 2000)
- Personal interviews and Navy records search (2000)

The following sections summarize each of the above referenced investigations or activities.

1.4.1 RCRA Facility Assessments

An RFA was completed by A.T. Kearney, Inc., on October 13, 1988, and an updated RFA was completed by the PREQB on September 27, 1995, identifying 11 SWMUs and eight AOCs. The designations of AOCs and SWMUs have since been updated to include 12 SWMUs and three AOCs. Of these designations, nine SWMUs and three AOCs were included in the EPA Consent Order for the AFWTF investigation, as follows:

- SWMU 01 – Camp Garcia Landfill (Eastern Maneuver Area)
- SWMU 02 – Fuels Off-Loading Site (Camp Garcia)
- SWMU 04 – Waste Areas of Building 303 (Camp Garcia)
- SWMU 05 – Spent Battery Accumulation Area (Observation Post 1, Inner Range, AFWTF)
- SWMU 06 – Waste Oil and Paint Accumulation Area (Seabees Area, Camp Garcia)
- SWMU 07 – Waste Oil Accumulation Area (outside Building 303 at Camp Garcia)

- SWMU 08 – Waste Oil Accumulation Area (Observation Post 1, Inner Range, AFWTF)
- SWMU 10 – Sewage Treatment Lagoons (Camp Garcia)
- SWMU 12 – Solid Waste Collection Unit Area (Observation Post 1, Inner Range, AFWTF - formerly AOC B)
- AOC-A – Diesel Fuel Fill Pipe Area (Observation Post 1, Inner Range, AFWTF)
- AOC-F – Rock Quarry (Camp Garcia)
- AOC-G – Pump Station and Chlorinating Building at Sewage Lagoons (Camp Garcia)

The remaining three SWMUs not included in the Phase I RFI (SWMUs 03, 09, and 11) are located in the active military range area and are excluded from any corrective action requirements at this time under the terms and conditions of the EPA Consent Order Docket No. RCRA-02-99-7301.

1.4.2 Groundwater Resources/Well Inventory Investigation

A reconnaissance of the groundwater resources of Vieques was conducted by the USGS from 1982 to 1984 (USGS, 1989) in response to potential agricultural development on the island and questionable supply system reliability. A well inventory report for Vieques was also completed by the USGS (USGS, 1995) that included maps and well-inventory data for 73 wells on Vieques, one of which is located within Camp Garcia.

1.4.2.1 Groundwater Resources

The Esperanza valley (or Valle de Esperanza), in the south-central portion of the island, contains the principal aquifer on Vieques. Pumpage of as much as 400,000 gallons per day of water from the aquifer resulted in saline water intrusion throughout the coastal zone of the valley. Operation of the well field in Esperanza Valley was discontinued in 1978 as a result of increasing salinity and maintenance problems. A pipeline was constructed in 1977 between eastern Puerto Rico and Vieques to supply potable water to the town of Isabel Segunda and the Esperanza valley.

In 1982, ruptures in the water supply pipeline from Puerto Rico reduced the amount of freshwater available to Vieques and water had to be shipped by barge from Puerto Rico to make up the deficit. During this time, plans for agricultural development were being considered. Although the pipeline was repaired, potential demands for agriculture greatly exceeded the pipeline capacity. The USGS began an investigation to define the groundwater resources of Vieques.

Until 1978, 10 wells were operated in the Esperanza valley and average withdrawal was approximately 425,000 gallons per day. As pumpage increased, the salinity of the water increased. The Resolucion valley (or Valle de Resolucion), located in northwest Vieques, is the second largest valley on the island. The majority of the wells in the Resolucion valley were abandoned or could not be reached.

At the time of the investigation, Camp Garcia contained six water storage tanks, each with a capacity of 42,000 gallons. The tanks were filled gradually to limit pumpage from the wells at Camp Garcia to approximately 25 gallons per minute. The Groundwater Resources

Report (USGS, 1989) did not state the number of wells located within Camp Garcia, but two wells shown on figures in the report appeared to be located north and northwest of Camp Garcia. The well inventory report (USGS, 1995) indicated that one well was located near Camp Garcia. It listed this well as unused and provided well construction details, which are provided in Appendix A of this report. The production well locations shown on Figure 1-3 are based on information presented in these USGS reports.

1.4.2.2 Findings

The 2-year investigation found that the principal aquifers on Vieques Island occur in the alluvial deposits within the Esperanza and Resolucion valleys. Unexplored alluvial deposits occur in the Playa Grande area, on the southwestern part of the island. A less productive aquifer occurs within the Camp Garcia area. Yields from wells in the Esperanza valley range from 5 to 60 gallons per minute. Pumpage from the area totaled as much as 450,000 gallons per day through 1977. By 1989, pumpage was nearly zero because the majority of water used on Vieques was pumped from Puerto Rico via a submarine pipeline. Groundwater throughout Vieques generally contains high concentrations of sodium and chloride ions. The sodium-absorption ratio in samples from wells in Esperanza valley, Resolucion valley, and Camp Garcia approach values considered unacceptable for agricultural use.

1.4.3 Hydrogeologic Investigation

Baker completed a hydrogeologic investigation in August 1999 within the EMA on Vieques Island (Baker, 1999). The purpose of the investigation was to provide specific information regarding soil and groundwater conditions at the western property boundary of the EMA. The scope of the field program was as follows:

- Determine if the surface soil at the western property boundary contained explosive compounds
- Determine if the groundwater at the EMA contained explosive compounds and assess whether the potential existed for the compounds to migrate offsite
- Evaluate groundwater flow direction in the vicinity of the EMA boundary
- Assess the risk posed to potential receptors if explosives were found in either the surface soil or groundwater through an Ecological Screening Evaluation and a Baseline Human Health Risk Assessment

1.4.3.1 Field Investigation Activities

Field activities associated with this investigation included groundwater monitoring well and piezometer installation, groundwater sampling, and soil sampling.

Eleven monitoring wells (shown on Figure 1-3) were installed along the western EMA property boundary, and groundwater samples were collected and analyzed for explosive residues, pentaerythritol tetranitrate (PETN), and nitroglycerin in accordance with SW846 Method 8330. Four monitoring wells were installed within the alluvial unconsolidated deposits, and seven wells were installed within the bedrock. Well construction details are provided in Appendix A.

Eight piezometers were installed at varying distances west of the property line, and groundwater elevations were measured to assess the groundwater flow direction.

A total of 32 soil samples were collected and analyzed for explosive residues, PETN, and nitroglycerin in accordance with SW846 Method 8330. Twenty-one samples were collected along the apparent storm drains that slope from the east to the west across Navy property, and 11 soil samples were collected at the monitoring well locations shown on Figure 1-3.

1.4.3.2 Findings

Hydrogeologic data indicate that groundwater flow in the bedrock is primarily to the north and south from the middle of the island. Therefore, groundwater flow within the bedrock is not likely to flow from Navy property offsite to the west. Groundwater in the alluvial deposits flows primarily to the east, and is therefore also unlikely to flow from the Navy property offsite to the west.

No explosive compounds were detected in either the soil or groundwater samples collected during the investigation. As a result, no chemicals of potential concern (COPCs) and no human health or ecological risk exists could be identified with regard to explosives in the study area.

1.4.4 Aerial Photographic Analyses

Two aerial photographic analyses of the EMA/AFWTF have been completed. Various aerial photographs spanning from 1936 to 1994 were evaluated during these investigations.

1.4.4.1 Aerial Photographic Analysis, SWMUs 01 and 10, AOCs F and G

The first analysis was completed in August 1999 (Lockheed Martin, 1999) and presents an analysis of historical aerial photographs of SWMUs 01 and 10 and AOCs F and G, all located east of Camp Garcia within the EMA (see Figure 1-2). A total of six sets of historical photographs spanning from 1959 to 1984 were analyzed for this report. The areas analyzed include SWMU 01 – Camp Garcia Landfill, SWMU 10 – Sewage Treatment Lagoons, AOC G – Pump Station and Chlorination Building at Sewage Lagoons, and AOC F – Rock Quarry. Complete descriptions of each SWMU and AOC are provided in Section 2.

1.4.4.2 Aerial Photographic Analysis of EMA/AFWTF

The second aerial photo analysis was completed in August 2000 (ERI, 2000). Aerial photographs dated 1937, 1959, 1962, 1964, 1967, mid-1970s, and 1985 were evaluated. This analysis documents activity in both the EMA and the AFWTF, including the nine known SWMUs, three known AOCs, and 23 other potential sites identified on the photographs. These sites are referred to as photo-identified areas or PIs. Figure 1-4 was developed as part of this investigation and shows the locations of all identified SWMUs, AOCs, and PIs within the EMA and AFWTF. Table 1-1 lists each site, years active, and a brief description of each site shown on Figure 1-4. Further detail concerning each site is provided in Section 2.

TABLE 1-1
Aerial Photographic Analysis – Identified Sites
Camp Garcia/Vieques

Site	Year(s) Active	Brief Description
SWMU 01	1959-post 1964	Camp Garcia Landfill. Debris noted in trenches and fill areas from 1959 to 1964. Inactive by mid-70s.
SWMU 02	1959-mid-1970s	Fuels Off-Loading Site. Vertical tanks, containers, staining and light-toned material noted.
SWMU 04	Mid-1970s-1994	Waste Areas of Building 303. No significant findings were noted within the Building 303 Area (see Camp Garcia for other open storage areas and features noted within this vicinity).
SWMU 06 & 07	Mid-1970s-1994	Waste Oil and Paint Accumulation Areas. No significant findings were noted within this area (see Camp Garcia for other open storage areas and features noted within this vicinity).
Camp Garcia	1959-1994	Open storage, containers, debris, staining and a burn area were noted within Camp Garcia.
SWMU 05, 08, 12 & AOC A	1962-1994	Spent Battery Accumulation Area (SWMU 05), Waste Oil Accumulation Area (SWMU 08), Solid Waste Collection Unit (SWMU 12), and Diesel Fuel Fill Pipe (AOC-A). Dark-toned or burned area noted in 1962. Containers, possible debris and light-toned material noted within the site area. A probable pipeline, staining, ground scars, probable containers, a probable fill area and buildings were noted onsite.
SWMU 10 and AOC G	Mid-1970s-1985	Sewage Treatment Lagoons and Pump/Chlorination Building. Four lagoons (SWMU 10), Chlorination Building (AOC-G), piping and series of ditches noted in mid-1970. Area beginning to re-vegetate in 1985.
AOC F	1959-1994	An excavation with dark-toned staining visible in 1959. Probable debris, light-toned material and light-toned objects noted in 1962 and 1964. New excavation activity noted in 1994.
PI-1	1937-1985	Persistent ground scarred area.
PI-2	1959-1985	Persistent ground scar, discolored soil.
PI-3	1959-mid-1970s	Persistent ground scar. Re-vegetated by 1985.
PI-4	1959-1964	Series of trenches and disturbed ground. Trenches filled/covered by 1962. An area of disturbed ground is visible within the southeast corner of this area in 1964.
PI-5	1959-1964	Ditches from airfield lead to cleared areas and a possible fill area near and into Puerto Ferro.
PI-6	1959-1994	Vertical tanks, large surface impoundment and pump house at probable water treatment plant. Impoundment no longer visible by 1985.
PI-7	1959-1994	Persistent ground scarred areas.
PI-8	1959-mid-1970s	Open storage, vehicle and equipment maintenance area, staining.

TABLE 1-1

Aerial Photographic Analysis – Identified Sites
Camp Garcia/Vieques

Site	Year(s) Active	Brief Description
PI-9	1959-1964 – storage area; 1959-1994 – fill area	Open storage of probable munitions/explosives. Fill with debris located east of storage area.
PI-10	1962-1964	Series of four impoundments with liquid.
PI-11	1962	Access road leading to probable fill area with possible containers.
PI-12	Mid-1970s-1994	Light-toned material in cleared area.
PI-13	Mid-1970s	Light-toned material in excavation. Re-vegetated by 1985.
PI-14	Mid-1970s	Two pits with light-toned material and possible debris.
PI-15	Mid-1970s – 1994	Pit with liquid. Access road leads to pit.
PI-16	1962	Access roads leading to circular area of disturbed ground and light-toned material, possible burial area.
PI-17	1962	Pits, possible fill area, debris.
PI-18	Mid-1970s	Excavation/possible fill area. Area re-vegetated by 1985.
PI-19	Mid-1970-1985	Disturbed ground. Filled/graded by 1985.
PI-20	1964-1985	Disturbed ground, possible fill area.
PI-21	1959-Mid-1970s, 1994	Vertical tank, pits, disturbed ground. Possible quarry activity; however, pits contained discolored liquid (brown, green). Re-vegetated by 1985. New clearing and grading activity noted in 1994.
PI-22	1994	Possible debris and excavations with liquid noted in 1994.
PI-23	1959-1967	Large pit that did not appear to be a foxhole-training pit noted from 1959 to 1967.

1.4.5 Personal Interviews and Navy Records Search

In addition to the reports described above, personal interviews and a Navy records search was conducted to gather information to identify and describe areas of past or present solid or hazardous waste management. Details are summarized below.

1.4.5.1 Personal interviews

During a site visit conducted in June 2000 with an employee from NASD, four additional potential areas of concern (PAOCs) were identified. These potential areas of concern have been designated as PAOCs I, J, K, and L, respectively. They are located either inside or near the Camp Garcia Compound:

- **PAOC-I:** Former power plant and mechanics shop northeast of Bldg. 303 at Camp Garcia (structure still exists)

- **PAOC-J:** Former vehicle maintenance area at Camp Garcia (all structures were demolished prior to 1980)
- **PAOC-K:** Former wash rack area north of main road (structure demolished prior to 1980)
- **PAOC-L:** Former paint and transformer storage area (structure still exists)

A preliminary literature search indicated that little or no information was available for these additional facilities. The aerial photograph analysis summarized in Section 1.4.4.2 identified the vehicle maintenance area as a PI, but south of the main Camp Garcia road, not north of the road.

Additional records searches will be conducted during the Phase I RFI. If additional interviews and site inspections verify that a release of hazardous material has occurred at a site, that site will be added as an AOC.

1.4.5.2 Navy Records Search

The Navy conducted a review of the building construction and demolition records for the EMA in an effort to identify buildings or other structures that may have stored hazardous waste. No records of spills or releases of hazardous waste were identified during the records search.

A closure report was identified for the UST at AOC A (designated as UST 1005). UST 1005, a 15,000-gallon diesel tank, was excavated and removed during July 1997. Four soil samples were collected and analyzed for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds. All sample analysis results were below respective laboratory detection limits. A replacement tank was placed and clean soil was backfilled and compacted.

Six small arms ranges (SARs) are also located at the EMA, outside of the live impact area (LIA). The locations of these SARs are shown in Figure 1-2.

The demolition records search identified several structures that could have posed a threat to the environment, including a filling station, several boilers, and firing ranges. However, the locations of these structures are uncertain. These identified non-range structures are considered PAOCs and will be investigated during the Phase I RFI. Table 1-2 summarizes demolition records search information. The ranges identified on Table 1-2 (Facility numbers RNGL1-RNGL3 and RNGA6-RNGA9) are thought to have been located in the LIA and classified by the type of ammunition used at the range.

1.4.5.3 Transfer of NASD to Camp Garcia

In response to the presidential directive signed on January 31, 2000, the Navy is in the process of transferring all activities currently conducted at NASD to Camp Garcia. NASD provides support for training conducted at the AFWTF, including moving of munitions, vehicle maintenance, roadwork, and general site maintenance activities. The transfer of NASD to Camp Garcia will require the use of Building 303 and the areas outside Building 303 for storage, as well as increased use of the sewage treatment lagoons, and the use of the rock quarry for road maintenance.

TABLE 1-2
Demolition Records Search Results
Camp Garcia/Vieques

Building Type	Facility Number	Date Built	Date Demolished	Description/Comments
Dispatch office/fuel (PAOC)	4503	1986	December 1991	Dispatch office, fuel facility, sleeping quarters
Filling station by Building 4503 (PAOC)	-	1985	November 1992	Fuel farm, filling station
Boiler Room (PAOC)	238CG	1953	September 1989	Heating Plant Building
Pump House (PAOC)	500CG	1953	September 1989	Water Treatment Facility building
Boiler House (PAOC)	607	1963	September 1984	Heating Plant Building
Boiler House (PAOC)	617	1970	January 1984	Heating Plant Building
Petroleum, Oil, and Lubricants (POL) pipeline (PAOC)	-	1969	September 1984	POL Pipeline
Ammo Open Dump Storage	-	1959	July 1986	Open ammunition storage pad
Range Safety Tower/Range #1	4518	1986	November 1992	Weapons range operation Tower
Range Safety Tower/Range #2	4519	1986	November 1992	Weapons range operation Tower
Range Safety Tower/Range Area 5-A	4521	1986	November 1992	Weapons range operation Tower
Range Safety Tower/Range Area 5-B	4520	1986	November 1992	Weapons range operation Tower
Observation Bunker/Range Area #6	4522	1986	November 1992	Weapons range operation Tower
Mech. Shop – Grounds (GRDS) Contractor (PAOC)	305	1975	December 1991	Public Works (PW) storage shed
Hawk Firing Sites	RNGL1	1956	November 1992	Aircraft gun bomb rocket range
Hawk Firing Sites	RNGL2	1956	November 1992	Aircraft gun bomb rocket range
Hawk Firing Sites	RNGL3	1956	November 1992	Aircraft gun bomb rocket range
Demolition Range	RNGA6	1956	November 1992	Surface projectile range
Tank Recoilless Rifle ONTOS	RNGA7	1956	November 1992	Surface projectile range
Tank ONTOS Rockets	RNGA8	1956	November 1992	Surface projectile range
Mortars	RNGA9	1956	November 1992	Surface projectile range

Because of the expedient nature of the transfer, preliminary environmental sampling of four of the RCRA consent order sites potentially affected by the transfer was conducted in June 2000. Sampling was completed at the following sites:

- SWMU 04 – Waste Areas of Building 303 (Camp Garcia)
- SWMU 06/07 – Waste Oil Accumulation Area (outside building 303 at Camp Garcia)
- SWMU 10 - Sewage Treatment Lagoons
- AOC F – Rock Quarry (Camp Garcia)

The results and conclusions of this investigation will be included in the Phase I RFI Report.

In addition, the transfer of military and civilian personnel (approximately 77 personnel) from NASD to Camp Garcia will require building demolition and renovation of several structures at Camp Garcia. It is anticipated that 10 currently abandoned buildings and one building still in use at Camp Garcia will require renovation. Two facilities at Camp Garcia, including Building 200 (a metal-framed Quonset hut), will be demolished.

1.5 Permits

The RCRA Subpart X permit for the OB/OD facility located at the AFWTF is the only known permit received at the EMA or AFWTF.

On December 10, 1987, EPA promulgated standards regulating miscellaneous units (including OB/OD of waste explosives) in Title 40 Code of Federal Regulations (CFR) Part 264, Subpart X. The Subpart X regulations are general, not technology-specific. In summary, miscellaneous units are required to be located, designed, constructed, operated, maintained, and closed in a manner that will prevent any unsafe releases of hazardous constituents into the groundwater, subsurface environment, surface water, wetlands, soil surface, or air.

The Navy has complied with the requirements of the Subpart X permit for the OB/OD facility at the AFWTF, and has received no notices of violation from EPA regarding permit compliance.

In September 1984, the AFWTF also received a permit for discharge under the National Pollutant Discharge Elimination System (NPDES) within specifically defined areas.

SECTION 2

Descriptions of SWMUs, AOCs, and PIs

A total of nine SWMUs, three AOCs, and 23 PIs will be investigated in the Phase I RFI of the Naval Facility (Figures 1-2 and 1-4, presented previously). During June 2000, CH2MHILL conducted preliminary site assessments at SWMU 04, SWMU 06/07, SWMU 10, and AOC F because of the ongoing transfer of NASD activities to Camp Garcia, as described in Section 1.4.5.3. The results of these assessments will be included in the Phase I RFI report. All 23 PIs identified by the aerial photograph analysis will be visually inspected and interviews will be conducted to determine if further investigation is warranted in each area.

Photographs of the SWMUs and AOCs are provided in Appendix B. Descriptions of the SWMUs and AOCs provided in the following subsections are based on a Preliminary Review (PR) and a Visual Site Inspection (VSI), provided either in the RFA (PREQB, 1995), or in the Administrative Order On Consent (USEPA, Region II), and on a site visit conducted by CH2MHILL on February 2, 2000. Descriptions of the PIs are based on the aerial photographic analysis discussed in Section 1.4.4.2.

2.1 SWMU 01 - Camp Garcia Landfill

According to the RFA, the Camp Garcia Landfill is located in the EMA approximately 4,000 feet north-northwest of Blue Beach, roughly 2 miles east of Camp Garcia (PREQB, 1995).

According to the IAS report, this SWMU was in operation from approximately 1954 to 1978, when it became inactive. While this SWMU was operational, it was used for the disposal of paper, corrugated containers, cans and food packaging material, rags, scrap metal, and yard waste. Normal trash (food waste, waste paper, etc.) from both Camp Garcia and the Inner Range of the AFWTF was also disposed in the landfill. The landfill was not lined. It serviced approximately 150 individuals, depending on military exercises. One 5-ton dump truck was used everyday, 5 days per week, to dispose waste at this site. According to the PREQB (1995), approximately 1,800 to 3,120 tons of waste were distributed over the 100 to 200-acre area. An aerial photo analysis of the landfill, however, indicated that the fill area extended over an area of approximately 55 acres (ERI, 2000). When operation of the landfill ceased in 1978, a cap consisting of compacted native soils was installed. Today, the landfill is vegetated with dense grasses. A gravel road located down the center of the landfill was constructed in the mid-1980s. During the 1995 RFA (PREQB, 1995), no signs of erosion or stresses on vegetation were observed in the landfill area, and no documentation was found regarding releases of hazardous constituents from the landfill (PREQB, 1995).

During the February 2000 CH2M HILL site visit, no signs of previous landfill activities were visible at the site. The site was heavily vegetated. No previous environmental sampling has been performed at the landfill. Based on the aerial photographic

interpretation by ERI (ERI, 2000), specific landfill cells and trenches were identified, and the overall impacted area of the landfill was determined to be approximately 55 acres.

2.2 SWMU 02 - Fuels Off-Loading Site (Camp Garcia)

SWMU 02 is located at Camp Garcia, and is the former location of four aboveground storage fuel tanks, including two 20,000-gallon tanks and two 30,000-gallon tanks, which were used to store diesel fuel, unleaded gasoline, AVGAS, and JP-5 fuel. These tanks became operational in 1953 and were removed between 1978 and 1979. Tank refueling occurred every 3 months, and involved pumping fuel from a barge through an 8-inch submarine line to each of these tanks. Prior to initiating this refueling, seawater had to be flushed from the submarine line, during which approximately 1,000 gallons of fuel was reportedly discharged into the ocean, as well as onto the soil along the shoreline in the vicinity of the concrete loading ramp at the shoreline. According to the IAS, this refueling process occurred for approximately 25 years; therefore, roughly 100,000 gallons of fuel was potentially discharged during this period of time.

The sludge that accumulated in the bottom of the tanks was periodically removed by a private contractor and disposed of on the main island of Puerto Rico.

The site is currently overgrown with grass and small shrubs, with only minimal signs of previous activity consisting of the concrete loading ramp and the steel pipeline supports next to the loading ramp. During the 1995 RFA (PREQB, 1995), no signs of previous releases of fuel to either the soil at the site or the ocean along the shorelines were apparent, and no release controls were identified. During the site visit conducted on February 2, 2000, no signs of the tanks or piping were present. Only the steel supports for the pipeline for the loading area were present.

No previous environmental sampling investigations have been conducted at this site.

2.3 SWMU 04 - Waste Areas of Building 303 (Camp Garcia)

According to the RFAs, the waste areas located at Building 303 at Camp Garcia include a spent battery accumulation area, a catch basin for hydraulic oil, a cleaning/degreasing basin, and a storage area for waste rags, absorbent material, and grease. Per the classifications in the 1988 and 1995 RFAs, the oil catch basin, cleaning/degreasing basin, and storage area for rags, absorbent material, and grease were designated as AOCs C, D, and E, respectively. The areas have since been determined to be SWMU. Because they are all located inside or adjacent to Building 303 at Camp Garcia, they were all included as one SWMU (SWMU 04) in the Administrative Order On Consent (USEPA, Region II).

The battery accumulation area consists of a small building adjacent to Building 303 designated as "Corrosive Materials Storage." In the past, it contained spent batteries and battery acid, which were disposed of offsite at NSRR. According to the 1995 RFA, this building was established as a storage area for batteries ever since this building was erected in the 1960s. During the 1995 RFA, no batteries or acid were present at this location, nor were there visible signs of acid leakage on the concrete floor from previous storage of these

materials. These same conditions were observed during the CH2M HILL February 2000 site visit.

The catch basin for hydraulic oil (formerly AOC C) is approximately 5 feet long and 6 inches wide, and is located inside Building 303. It was designed to catch spills and leaks of hydraulic oil from vehicles during maintenance operations. During the 1995 RFA (PREQB, 1995), no signs of leakage were noted on the cement floor under the basin. These same conditions were observed during the CH2M HILL February 2000 site visit, although this area could be viewed only through a locked chain link fence (see Appendix B) at the time of the visit because the building was locked.

In the past, the storage area for rags, adsorbent material, and grease (formerly AOC D) contained barrels of waste grease, rags, and absorbent materials generated during cleanup of spills within Building 303. This area consists of a small building located adjacent to Building 303 and is designated as “Flammable Storage.” According to the 1988 and 1995 RFAs, spent batteries were also once stored in this area. During the 1995 RFA (PREQB, 1995), no signs of spills were noted. This same condition was observed during CH2M HILL’s February 2000 site visit.

Because of the ongoing transfer of NASD activities to Camp Garcia, CH2M HILL conducted a surface soil sampling investigation at SWMU 04 in June 2000. Results will be presented in the Phase I RFI report.

2.4 SWMU 05 - Spent Battery Accumulation Area (Observation Post 1, Inner Range, AFWTF)

SWMU 05 is located in the vicinity of Observation Post 1 at the Inner Range portion of the AFWTF. The area is similar to SWMU 04; however, the batteries and battery acid were stored outside on a gravel driveway. According to the 1995 RFA, the acid from these batteries was typically emptied into plastic containers and shipped to NSRR.

Although the start-up date for this SWMU is unknown, it remains active today. During the 1995 RFA (PREQB, 1995), a total of nine batteries were stored at this site on the gravel driveway. There were no signs of any spills or leaks from these batteries. No release controls were identified at this SWMU (PREQB, 1995).

During the CH2M HILL February 2000 site visit, release controls (plastic storage trays) for battery storage were present, but no batteries were stored at the site. No signs of releases of battery acid were observed.

No previous environmental sampling investigations have been conducted at this site.

2.5 SWMU 06 - Waste Oil and Paint Accumulation Area (Seabees Area at Camp Garcia)

According to the 1988 RFA, this area was used by the Seabees as a storage area for waste oil and paint. The waste oil at this location was containerized in 55-gallon drums, and the paint was housed in small containers. During the RFA, tires and two drums of lubricating

oil were present at the site. The waste oil and tires were stored on a grassy area until they were shipped offsite to NSRR. The RFA stated that this area became active in approximately 1978, and was still active in 1988. During the 1995 RFA, signs of oil leakage onto the soil surface from the drums were visible, and no release controls were present at the site (PREQB, 1995).

The site currently consists of a concrete slab and a small chain-link cage area. Because SWMU 06 is adjacent to SWMU 07, they will be investigated at the same time as one contiguous unit. During the CH2M HILL February 2000 site visit, no drums or waste materials were present at the site, and only a minor amount of soil staining (approximately 4 square feet) was observed off the edge of the concrete pad.

2.6 SWMU 07 - Waste Oil Accumulation Area (Outside Building 303 at Camp Garcia)

SWMU 07 is a waste oil accumulation area located outside Building 303 at Camp Garcia, which was used by the U. S. Marines 3 months per year during training exercises. During these 3 months, Marines conducted training exercises at the EMA, and used the waste oil accumulation area to store waste oil from the maintenance of their vehicles. During the 1988 RFA, one open-top 55-gallon drum, a 25-gallon trash can, and two drums cut in half were present in the waste oil accumulation area. It was reported that the soil in the waste oil accumulation area was typically stained with waste oil as a result of spillage and leakage after vehicle maintenance procedures. Once the Marines completed their training, the stained soil was reportedly mixed with sand, excavated, containerized in 55-gallon drums, and shipped to NSRR.

During the 1995 RFA, drums full of waste oil were present in the waste oil accumulation area, the soil in the area was stained with oil, and no release controls were present (PREQB, 1995). During the CH2M HILL February 2000 site inspection, no drums of waste oil or other material were present in the area. The only evidence of waste oil in the combined SWMU 06/SWMU 07 area was approximately 4 square feet of stained soil observed off the edge of the concrete pad (see Section 2.5).

Because of the ongoing transfer of NASD activities to Camp Garcia, CH2M HILL conducted a surface soil sampling investigation at SWMU 06/07 in June 2000. Results will be presented in the Phase I RFI report.

2.7 SWMU 08 - Waste Oil Accumulation Area (Observation Post 1, Inner Range, AFWTF)

SWMU 08 consists of a waste oil accumulation area, which is located outside the generator building at Observation Post 1 on Cerro Matias of the AFWTF.

According to the 1988 RFA, the waste oil accumulation area contained drums of both waste lubricants and oils. The drums were stored on bare soil prior to being shipped offsite to NSRR. The accumulation area began operation in approximately 1978, and remained active

in 1988. During the 1995 RFA, minor spills of lubricating oil onto the soil were present in the accumulation area, and no release controls were present (PREQB, 1995).

During the CH2M HILL February 2000 site inspection, no soil staining was evident in the accumulation area, and the drums were stored in plastic secondary containment trays for release control.

No previous environmental sampling investigations have been performed at SWMU 08.

2.8 SWMU 10 - Sewage Treatment Lagoons

According to the 1988 RFA, the sewage treatment lagoons for Camp Garcia went into service in the early 1950s. There are four unlined lagoons; two of them serve as equalization/treatment lagoons, and the other two provide polishing treatment. Effluent from the final two polishing lagoons was then chlorinated in a chlorine contact chamber and discharged to the sea.

In the past, the lagoons were not lined. In 1974, after the level of activity and associated domestic wastewater generation rate significantly decreased at Camp Garcia, the treatment lagoon system was modified to make it a no-discharge system. The lagoons were lined using a 2-foot compacted clay and plastic liner system, and now serve as evaporation lagoons for the wastewater.

Although the presence of hazardous constituents in the sanitary wastewater is unlikely, their presence or absence has not been confirmed through sampling. No known releases of hazardous constituents have occurred at this site (PREQB, 1995).

Inspection of the sewage lagoon system during the CH2M HILL February 2000 site inspection revealed that the lagoon system was overgrown with vegetation and did not appear to be active.

Because of the transfer of NASD activities to Camp Garcia, increased use of the sewage treatment plant is expected. CH2M HILL conducted a preliminary investigation at SWMU 10 in June 2000. Results will be presented in the Phase I RFI report.

2.9 SWMU 12 - Solid Waste Collection Unit Area (Observation Post 1, Inner Range, AFWTF)

This area was formerly referred to as AOC B, but according to the Administrative Order of Consent (USEPA, Region II), it was designated as a waste management unit identified as SWMU 12.

The solid waste unit collection area serves as a solid waste storage and transfer area, prior to pickup of the solid waste for disposal at the Vieques Island landfill. Containers used to store garbage collected at the site include wooden boxes, wooden trailers, and metal dumpsters and cans. During the 1995 RFA, only a wooden trailer was visible at this site (PREQB, 1995). During the CH2M HILL February 2000 site visit, two wooden trailers potentially filled with garbage were observed along a bend in the road below Observation Post 1.

No previous environmental sampling investigations have been performed at SWMU 12.

2.10 AOC A - Diesel Fuel Fill Pipe Area (Observation Post 1, Inner Range, AFWTF)

According to the 1988 RFA, this area contained the fill pipe for the UST located at Observation Post 1 in the Cerro Matias area of the AFWTF. The UST was located 25 feet southwest and downgradient of the fill pipe.

The UST and the fill pipe were first put into service in approximately 1978. During the 1995 RFA, the soil surrounding the fill pipe was stained apparently as a result of fuel spills that had occurred during tank refueling, and the total impacted area was approximately 6 feet by 6 feet. No fuel releases from the UST were apparent, and no release controls were found at this site (PREQB, 1995).

The UST, associated piping including the fill pipe, and surrounding soil were excavated and removed for disposal in 1997. As described in Section 1.4.5.2, four confirmation soil samples were collected from the excavation and analyzed for petroleum-related constituents. No petroleum-related constituents were detected in any of the four soil samples. The UST was replaced with a new UST.

2.11 AOC F - Rock Quarry (Camp Garcia)

The rock quarry is located southwest of the former Camp Garcia landfill. This site is used to obtain gravel used by the Navy for construction of roads and other construction projects. During the 1995 RFA, used tires and some paper waste were visible at this location (PREQB, 1995).

During the CH2M HILL February 2000 site inspection, no waste tires or other waste materials were observed at the quarry, and the quarry did not appear to be active.

Because of the transfer of activities from NASD to Camp Garcia, the rock quarry may continue to be used for road maintenance activities. CH2M HILL conducted an investigation in June 2000 to determine if hazardous constituents existed in the surface soil where Navy personnel would remove quarry material. Results will be presented in the Phase I RFI report.

2.12 AOC G - Pump Station and Chlorination Building at Sewage Lagoons (Camp Garcia)

This site, which is located adjacent to the sewage treatment lagoons at Camp Garcia, consists of a building that housed a pump station and chlorination equipment used in the past for the chlorination of the lagoon system effluent. These facilities were placed into operation in the 1950s and are no longer in service.

The building is constructed of concrete, and is built partially below grade. During the 1995 RFA, stains were visible on the concrete floor in the building, reportedly as a result of

wastewater overflows. No signs of vegetation stress or staining were apparent, however, in the grassy area surrounding the building (PREQB, 1995).

During the CH2M HILL February 2000 site inspection, no staining was observed in the chlorination building, and the site was inactive and overgrown with vegetation.

No previous environmental sampling investigations have been performed at AOC G.

2.13 Photo-Identified Areas

As described in Section 1.4.4.2, 23 photo-identified or PI sites were identified during an aerial photographic analysis completed in August 2000 (ERI, 2000). Each PI is shown on Figure 1-4. During the Phase I RFI, each PI will be visually inspected and Navy personnel will be interviewed to determine whether further investigation is warranted. Table 2-1 presents a detailed description of the aerial photographic analysis findings for each site by year.

TABLE 2-1

Aerial Photograph Chronological Analysis of PIs
Camp Garcia/Vieques

Date	Frame #	Site	Description
1936-37	K-25-87	PI-1	Ground scarred area.
1959	23	PI-1	Ground scarred area and light-toned material.
1962	614	PI-1	Ground scarred area remains.
1967	22DD-189	PI-1	Ground scarred/stained area.
Mid-1970	126	PI-1	Ground scar remains.
1985	1-14	PI-1	Re-vegetating.
1959	25	PI-2	Ground scarred area.
1962	9789	PI-2	Area remains scarred. Ground surface is discolored (gray/black).
1964	13DD-156	PI-2	Ground scarred/disturbed ground remains.
Mid-1970	85	PI-2	Ground scar.
1985	1-11	PI-2	Ground scar remains.
1959	25	PI-3	Ground scarred area, probable pits.
1964	13DD-156	PI-3	Ground scar/disturbed ground remains.
Mid-1970	85	PI-3	Majority of ground scar re-vegetating.
1959	26	PI-4	Trench with possible debris. Several probable trench scars nearby (gone by 1962).
1964	13DD-158	PI-4	Trenches seen in 1959 are no longer visible. An area of disturbed ground (possibly a fill area) is visible south of the former trench area.
1959	26	PI-5	Airfield staining and associated ditch to Puerto Ferro. An access road leads to a cleared area at the edge of Puerto Ferro, just west of the ditch. An excavation with liquid is noted farther west.
1962	9783	PI-5	Stained area no longer present. Ditches to Puerto Ferro remain. Access road leads to cleared area at edge of Puerto Ferro.

TABLE 2-1

Aerial Photograph Chronological Analysis of PIs
Camp Garcia/Vieques

Date	Frame #	Site	Description
1964	13DD-158	PI-5	Ditch to Puerto Ferro remains. Receives runoff from airfield and PI-8 (open storage area).
1959	26	PI-6	Probable treatment plant. Impoundment with liquid, vertical tanks and six buildings are present. One of the six buildings located in the eastern portion of the site appears to be a pump house.
1962	9783	PI-6	Impoundment empty. Tanks remain.
1964	13DD-158	PI-6	Tanks and impoundment remain.
1985	1-09	PI-6	Five vertical tanks and a building are visible. The impoundment area has completely re-vegetated.
1994	26	PI-6	Four vertical tanks and several small structures are visible.
1959	26	PI-7	Persistent ground scarred areas.
1964	13DD-158	PI-7	Ground scarred/disturbed ground.
1985	1-09	PI-7	Ground scarred areas remain.
1994	26	PI-7	Ground scar remains; however, is significantly smaller in size.
1959	26	PI-8	Vehicle and equipment storage, maintenance area, and staining.
1962	9785	PI-8	Open storage of vehicles, equipment and multi-colored materials (some probably metallic). Heavy staining noted south of probable maintenance buildings. Light-toned material and staining noted in eastern portion of site.
1964	13DD-158	PI-8	Vehicle and equipment storage remains. Probable metallic material remains to the south. Staining noted to east.
Mid-1970	83	PI-8	Only a small amount of open storage materials remain. Probable staining is noted on the north side of a probable maintenance building. The southern portion of the site appears inactive.
1985	1-09	PI-8	Inactive.
1959	26	PI-9	Open storage of probable explosives in partially bermed areas (see 1962 for details). Fill area with possible debris is noted at edge of Puerto Ferro and likely associated with the explosives storage area to the west.
1962	9783	PI-9	Open storage of probable explosives and containers in bermed areas. Disposal of white material noted in large trench at north end of site. Fill area to the east has increased in size since 1959. Debris is visible along the northern end of the fill area.
1964	13DD-158	PI-9	Open storage of containers and trailers are noted. Trench noted in 1962 has been covered. Fill area located to the east remains. Possible debris is visible on the northern end of the fill area.
Mid-1970	114	PI-9	Majority of storage area is re-vegetating. Fill area remains. Debris not discernible.
1985	1-09	PI-9	Majority of storage area remains vegetated. A probable pit is visible to the west. Fill area/possible debris visible to the east.
1994	26	PI-9	Ground scar. Fill area to the east remains. Vegetation growth healthy along northern end of fill area.

TABLE 2-1

Aerial Photograph Chronological Analysis of PIs
Camp Garcia/Vieques

Date	Frame #	Site	Description
1962	9785	PI-10	Series of six lagoons containing brown to black liquid. Liquid is also visible outside the lagoons to the north.
1964	13DD-158	PI-10	Lagoons inactive – re-vegetating. Site still not completely re-vegetated by 1985. Completely re-vegetated by 1994.
1962	9785	PI-11	Disturbed ground/possible containers at the end of access road.
Mid-1970	23	PI-12	Light-toned material noted in cleared/disturbed area (still present in 1985).
1985	2-35	PI-12	Light-toned material in cleared area remains.
1994	26	PI-12	Cleared area remains. Light-toned residue (not annotated) is visible along the eastern portion of the site.
Mid-1970	114	PI-13	Light-toned material present in excavation. Linear excavations and/or pits line an access road to the southwest.
1985	1-09	PI-13	Re-vegetated.
Mid-1970	114	PI-14	Two pits with possible debris and light-toned material.
Mid-1970	90	PI-15	Pit with probable liquid is visible. An access road can be seen leading to pit.
1985	2-37	PI-15	A large pit with liquid is visible within the Maneuver Area. An access road is visible leading to the pit.
1994	22	PI-15	Majority of pit has re-vegetated. Light-toned material is noted in the eastern portion of the pit.
1962	616	PI-16	Disturbed ground, light-toned material. Possible burial area.
1962	9795	PI-17	Pits, possible fill area and debris. Re-vegetated by 1985.
Mid-1970	83	PI-18	Excavation, possible fill area
1985	1-11	PI-18	Area is re-vegetating.
Mid-1970	83	PI-19	Large ground scarred/disturbed area –graded/cleared by 1985.
1985	1-11	PI-19	Area is cleared and graded. Light vegetation growth is visible over the cleared area.
1964	13DD-156	PI-20	A possible fill area containing possible debris is visible.
Mid-1970	118	PI-20	Possible fill area.
1985	1-11	PI-20	Possible fill area remains.
1994	26	PI-20	Fill area re-vegetating.
1959	26	PI-21	Area of disturbed ground with two probable trenches.
1962	9787	PI-21	Disturbed ground with two pits. One of the pits contains brown liquid. The southern pit contains green liquid. A vertical tank and vehicles and equipment are also visible. A larger area of disturbed ground is visible northwest of the site; however, no debris or pits are visible.
1964	13DD-156	PI-21	Pits no longer visible. Vehicles and probable quarry equipment is visible.
Mid-1970	118	PI-21	Site appears inactive – re-vegetating.

TABLE 2-1

Aerial Photograph Chronological Analysis of PIs
Camp Garcia/Vieques

Date	Frame #	Site	Description
1985	1-11	PI-21	Area appears inactive and re-vegetating.
1994	26	PI-21	New cleared/graded area visible.
1994	22	PI-22	Possible light-toned debris is evident in a wooded area near a launch point. Two excavations with light-toned liquid are visible south of possible debris.
1959	26	PI-23	Large pit with liquid noted near road intersection.
1962	599	PI-23	Large pit noted near road intersection. Does not appear to be foxhole or impact crater.
1967	22DD-195	PI-23	Pit remains.

SECTION 3

Nature and Extent of Contamination

As stated previously, a total of nine SWMUs, three AOCs, and 23 PIs will be investigated for the Naval Facility RFI (see Figures 1-2 and 1-4, presented previously). Because environmental sampling has not been implemented previously at the SWMUs and AOCs subject to the requirements of the Consent Order, no definitive releases have been confirmed at these sites. Preliminary sampling was conducted by CH2M HILL in June 2000 at SWMU 04, SWMU 06/07, SWMU 10, and AOC F. Results of this sampling will be evaluated and presented in the Phase I RFI report.

3.1 Previous Investigation Results

Based on the facility design and/or past operating practices at the SWMUs and AOCs described in Section 2, combined with visual evidence of releases of hazardous or solid wastes or hazardous constituents (i.e., staining of soil), the potential exists for contamination to exist at the SWMUs and AOCs. In addition, the 1988 RFA and 1995 updated RFA both indicated either known or suspected releases of hazardous constituents to the environment at the various SWMUs and AOCs. Accordingly, this information will be used to design the Phase I RFI approach.

As summarized in Section 1.4.3, no explosive compounds were detected in either the soil or groundwater samples collected during the Hydrogeologic Investigation conducted in 1999 (Baker, 1999). This indicates that no offsite migration of explosive compounds is occurring to the west from the EMA to the adjacent developed areas. As a result, no COPCs could be identified and no human health or ecological risk exists with regard to explosives along the western boundary of the EMA.

3.2 Exposure Pathways

Although groundwater and surface water are rarely used for municipal drinking water supply on Vieques Island (see Section 1.4.2), public water supply wells are located on Vieques Island for emergency use when drinking water supplies are not available via the undersea pipeline from the main island of Puerto Rico. Private, non-permitted wells may exist as well, and groundwater from such wells may be used for human consumption; no such cases of this are currently documented, however.

In addition, although access to the facility is restricted, the Navy allows routine access by the public for recreational swimming, picnicking, and possible recreational fishing and crabbing at beaches that are within the facility boundaries. Therefore, other possible pathways for potential exposure to contaminants include:

- Human consumption of faunal species that bio-accumulate potentially released hazardous constituents

- Accidental ingestion of, or dermal contact with, potentially contaminated surface waters and/or potentially contaminated soils
- Possible inhalation of potentially contaminated fugitive dust
- Possible flora and fauna exposure to potentially contaminated soils

Potential pathways for adverse impacts to the environment include:

- Discharge of potentially contaminated groundwater to the surface waters of the surrounding Caribbean Sea and associated bays
- Direct transport of potentially contaminated stormwater run-off to the surface waters of the surrounding Caribbean Sea and associated bays
- Fugitive transport of potentially contaminated dust to the surface waters of the surrounding Caribbean Sea and associated bays

SECTION 4

Interim Corrective Action Measures

Because no definitive releases that would present an imminent threat to human health or the environment have been confirmed at the SWMUs and AOCs described in this report, no interim corrective measures have been implemented at the SWMUs and AOCs.

SECTION 5

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